SECTION 9.0

Alternatives

The following sections discuss alternatives to the Sun Valley Energy Project (SVEP) as proposed in this Application for Certification (AFC). These include the "no project" alternative, power plant site alternatives, linear facility route alternatives, technology alternatives, water supply alternatives, and wastewater disposal alternatives. These alternatives are discussed in relation to the environmental, public policy, and business considerations involved in developing the project. The main objective of the SVEP is to produce economical, reliable, and environmentally sound electrical energy and ancillary services.

The Energy Facilities Siting Regulations (Title 20, California Code of Regulations [CCR], Appendix B) guidelines titled *Information Requirements for an Application* require:

> *A discussion of the range of reasonable alternatives to the project, including the no project alternative… which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and an evaluation of the comparative merits of the alternatives.*

The regulations also require:

> *A discussion of the applicant's site selection criteria, any alternative sites considered for the project and the reasons why the applicant chose the proposed site.*

9.1 Project Objectives

The key objective of the Sun Valley Energy project is to provide the most efficient peaking capacity available to the growing southern California market cost-effectively. As part of this effort the Applicant has identified the newly available GE Energy LMS100 as the most efficient technology available in the current market. The LMS100 has a nominal heat rate of 9,000 Btu/kWh HHV. To achieve such significant improvement in efficiency over other peaking technologies, the LMS100 includes an intercooler that requires cooling water. In addition, to the high efficiency, the LMS100 has a 10-minute start, sustained hot-day power, no maintenance penalty for cycling, and high part-power efficiency and load following capability to make it excellent technology to provide peaking capacity. Using the most efficient peaking technology minimizes the use of natural gas for each kilowatt-hour of electrical energy produced.

In addition to technology alternatives, an objective of the site selection was to minimize or eliminate the length of any project linears including gas and water supply lines, discharge lines, and transmission interconnections. This objective both minimizes potential offsite environmental impacts and cost of construction.

To respond to the need for peaking capacity in Southern California, the Applicant initiated a region-wide search for peaking power sites based on the following criteria:

- Adjacent to or near an existing substation where additional peaking capacity would serve growing markets near load centers and provide system stability as well as peaking energy
- Adjacent to or near high-pressure natural gas transmission lines
- Adjacent to or near recycled water supply for cooling purposes to maximize efficiency
- Adjacent to or near non-reclaimable wastewater discharge
- Industrial land use designation with consistent zoning
- Parcel large enough to accommodate the site including construction laydown
- Potential environmental impacts can be mitigated

The SVEP will provide peaking power to the grid to help meet the demand for electricity and to help replace nuclear and fossil fuel generation resources retired because of age or cost of producing power. The SVEP will enhance the reliability of the State's electrical system by providing peaking power generation near the centers of electrical demand. According to data included in the System Impact Study, SVEP's capacity is less than the peak amount of customer electrical load distributed from the Valley substation. In addition, as demonstrated by the analyses contained in this AFC, the project would not result in any significant environmental impacts. Therefore, as will be demonstrated below, there are no alternatives that would be preferred over the project as proposed.

9.2 The "No Project" Alternative

If the Applicant were to not build the SVEP (the "no project" alternative), it would not be possible to meet the project objectives. The "no project" alternative would forego all of the benefits associated with the SVEP project. In addition, the "no project" alternative would result in more energy production from existing power plants than would otherwise occur, and these currently include older, less efficient, and less environmentally sound generating units. This would have negative economic consequences for the region's commercial and residential rate-payers and for the regional economy.

In summary, the "no project" alternative would not serve the growing needs of the Inland Empire region and California's businesses and residents for economical, reliable, and environmentally sound generation resources.

9.3 Power Plant Site Alternatives

For comparison purposes, and to meet the requirements of the California Environmental Quality Act (CEQA) and Title 20, alternative sites were chosen that could feasibly attain most of the project's basic objectives. The alternative sites are shown in Figure 9.3-1.

The key siting criteria in considering these alternatives and the proposed SVEP site included the following factors:

- Location more than 1,000 feet from the nearest residential uses area

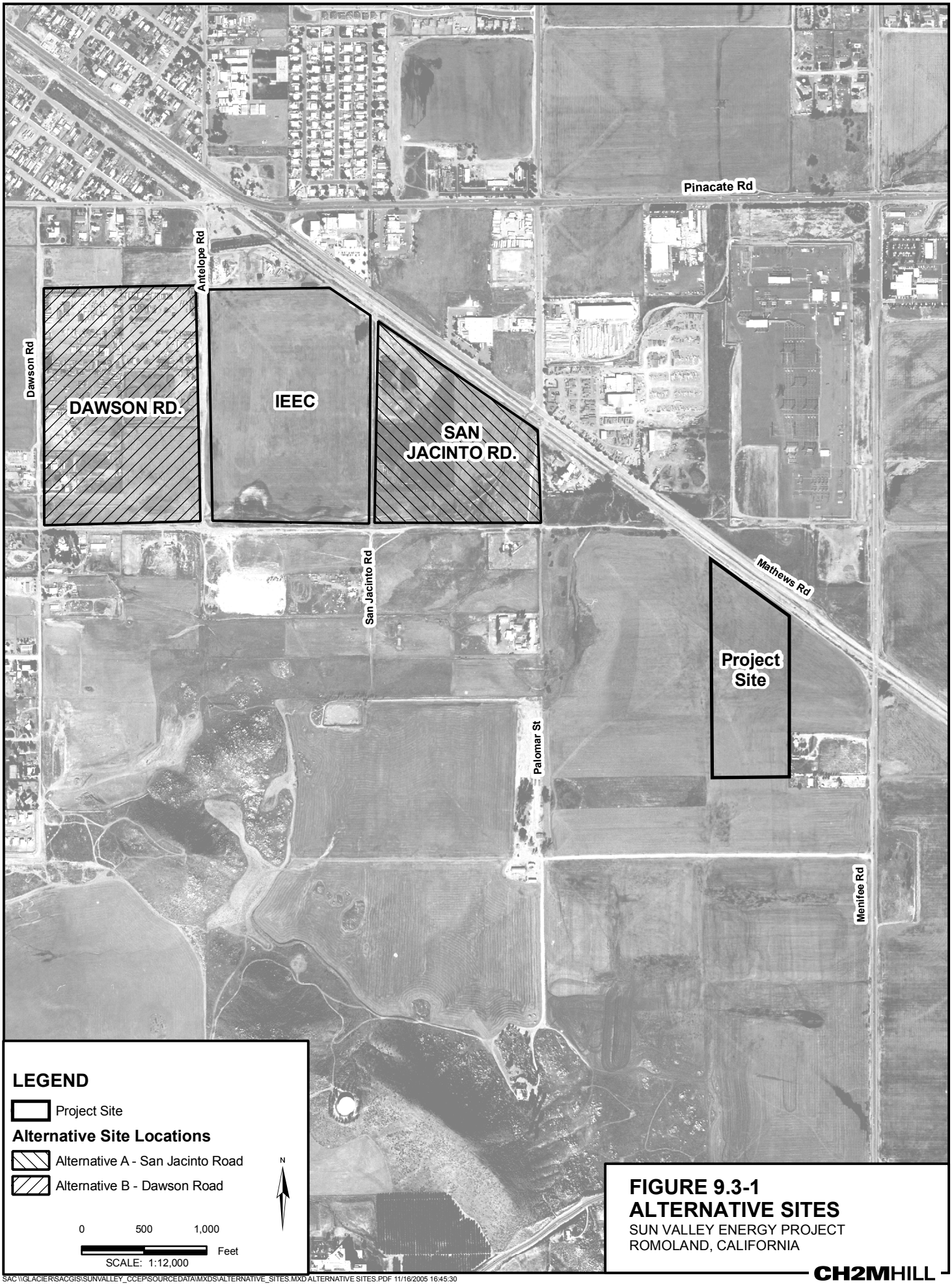

FIGURE 9.3-1
ALTERNATIVE SITES
SUN VALLEY ENERGY PROJECT
ROMOLAND, CALIFORNIA

CH2MHILL

SAC \\GLACIER\SACGIS\SUNVALLEY_CCEP\SOURCEDATA\MXDS\ALTERNATIVE_SITES.MXD ALTERNATIVE SITES.PDF 11/16/2005 16:45:30

- Location near the centers of demand for maximum efficiency and system benefit
- Land zoned for industrial use
- Access to tertiary treated wastewater from the Eastern Municipal Water District (EMWD) for cooling water
- Location near electrical transmission facilities
- Location near reliable natural gas supply
- A parcel or adjoining parcels of sufficient size for a power plant and construction laydown areas
- Site control (lease or ownership) feasibility
- Minimize construction impacts to existing residences and businesses
- Feasible mitigation of potential environmental impacts

9.3.1 Proposed Sun Valley Energy Project Site

The proposed site for the SVEP on Rouse Road, Romoland, California meets all of the project's objectives and, in addition, would result in no significant, unmitigated, environmental impacts. The proposed site is approximately 22.89 acres with 4.0 acres of available construction laydown area. The site is currently under control for Valle del Sol Energy, LLC (VSE) a wholly owned subsidiary of Edison Mission Energy. The project site is located south of the Burlington Northern Santa Fe railroad tracks at Matthews Road between Junipero and Menifee Roads. The Sun Valley site meets the following criteria:

- Just south of Southern California Edison's (SCE's) Valley substation in Riverside County. The project capacity would serve growing residential markets in the vicinity of the Valley substation. Interconnection will only require that transmission towers be located on the Sun Valley project site and in the Valley substation.
- Adjacent to three high-pressure natural gas transmission lines located in Menifee Road.
- Adjacent to existing EMWD recycled water supply lines that run along the northern boundary of the project site.
- Adjacent to potable water supply and sewer interconnection for domestic use.
- Near EMWD's non-reclaimable wastewater discharge pipeline that is currently being extended to the Inland Empire Energy Center (IEEC) project located less than 1 mile away.
- Designated light industrial land use with zoning that permits various utility land uses.
- Large enough to accommodate the proposed project including construction laydown.
- Located where any potential environmental impacts can be mitigated.

9.3.2 Alternative Site A: San Jacinto Road

This alternative is just south of Matthews Road, north of McLaughlin Road and adjacent to the eastern boundary of the IEEC power plant project currently under construction. This

site was considered very carefully because it met many of the criteria identified above. However, the site has been unavailable for purchase because of other planned development. In addition, this site partly located in the 100-year floodplain and contains a seasonal pond that provides habitat for the federally threatened vernal pool fairy shrimp. This site exhibits the following features:

- This site is near the Valley substation, although it would require an interconnection that would extend along an existing SCE 500-kilovolt (kV) and 115-kV easement for approximately 0.5 mile.
- Natural gas service is located in Menifee Road and will be extended along McLaughlin Road to serve the IEEC.
- Recycled water supply is also in McLaughlin Road.
- This site is very near a non-reclaimable wastewater discharge line that will be extended to serve the IEEC.
- This site land use designation is for Heavy Industrial development.
- There are a number of parcels that would need to be combined to be large enough to accommodate the project including construction laydown.

9.3.3 Alternative Site B: Dawson Road

Alternative site B is located within a 66.92-acre area northwest and immediately west of the IEEC, bounded by Dawson Road, Midas Way, Antelope Road, and McLaughlin Road. This area is made up of 15 separate parcels, and there are several different landowners. Several of the parcels are currently used for large equipment storage. As is the San Jacinto parcel, this site is in the Menifee North Specific Planning area. Site characteristics include the following:

- This site is more than 1 mile to the Valley substation, and it would require an interconnection that extended along an existing SCE 500-kV and 115-kV easement for more than 1 mile. This greatly increases the cost of interconnection and potential environmental impacts associated with a new transmission line.
- Natural gas service is located in Menifee Road and will be extended along McLaughlin Road to serve the IEEC. It would need to be extended further to this alternative site.
- Recycled water supply is also in McLaughlin Road.
- This site is very near a non-reclaimable wastewater discharge line that will be extended to serve the IEEC.
- This site land use designation is for Heavy Industrial development.
- There are a number of parcels that would need to be combined to be large enough to accommodate project site including construction laydown.
- Potential environmental impacts were considered more likely than other site alternatives because of the site's proximity to the existing Romoland Elementary School as well as numerous residences along the northern boundary.

9.3.4 Other Alternatives in the Vicinity

Sites to immediately to the east of the proposed project site and west of Menifee Road were considered and have the Light Industrial land use designation, but are zoned for Industrial Park development. A very large residential development called Menifee Valley Ranch has been approved for construction to the east of Menifee Road. The parcels, zoned for Industrial Park, just east of the proposed project site and west of Menifee Road would serve as a buffering land use between the peaking project and the planned residential development. After review with County officials, this property, available for development as a buffering land use from the residential development, was not considered the preferred site.

Sites east of the Valley substation were eliminated because they are generally zoned for residential development and would be very near the large-scale residential development currently under construction in the Menifee Valley Ranch.

9.4 Comparative Evaluation of Alternative Sites

In the discussion that follows, the sites are compared in terms of each of the 16 topic areas required in the AFC, as well as in terms of project development constraints. The most useful topics for comparison are as follows:

- **Project Development Constraints—** Are there site characteristics that would prohibit or seriously constrain development, such as significant contamination problems, or lack of fuel, transmission capacity, or water?
- **Land Use Compatibility—** Is the parcel zoned appropriately for industrial use and compatible with local land use policies? What is the distance to the nearest residential area? What is the distance to sensitive receptors?
- **Routing and Length of Linear Facilities—** Can linear facilities be routed to the site along existing transmission lines, pipelines, and roads? Will linear facilities be significantly shorter for a given site?
- **Water Supply—** Is a supply of recycled water readily available such that it is not necessary to use potable water for all or part of the cooling water?
- **Visual Resources—** Are there significant differences between the sites in their potential for impact on valuable or protected viewsheds?
- **Biological Resources—** Would there be significant impacts to wetlands or threatened or endangered species such that mitigation of these effects would be unduly expensive or constrain the supply of available mitigation resources?
- **Contamination—** Is there significant contamination onsite that would cause cleanup expense to be high or significant schedule delay?
- **Noise—** Is the site sufficiently near to a sensitive receptor area such that it would be difficult to mitigate potential noise impacts below the level of significance?

- **Use of Previously Disturbed Areas—**Has the site been previously disturbed? Does the site minimize the need for clearing vegetation and otherwise present low potential for impact on biological and cultural resources?
- **Other Environmental Categories—**Are there significant differences between the sites in their potential for impact in other environmental categories?

Table 9.4-1 compares the alternatives sites in terms of their basic site characteristics.

TABLE 9.4-1
Characteristics of the Alternative Sites

Characteristic	Site or Alternative		
	Sun Valley Energy Project	San Jacinto Road	Dawson Road
Acreage potentially available	20	26	67
Current use	Agriculture	Asphalt storage	Equipment storage
Previously disturbed?	Yes	Yes	Yes
Construction laydown area	Yes	Yes	Yes
Transmission line	600 feet	2,000 feet	4,700 feet
Recycled water available?	Yes	Yes	Yes
Water supply pipeline	10 feet	3.2 miles	--
Natural gas pipeline	750 feet	2,700 feet	1 mile
Non-reclaimable water pipeline	3,960 feet	1,500 feet	200 feet
Zoning	Manufacturing/Service Commercial	Heavy Industry	Heavy Industry
Contamination	Not identified	Asphalt?	Equipment waste?

There is no precise mathematical weighting system established for considering potential impacts in alternatives analyses. Some of the criteria used to compare the alternatives are more or less important to consider than others. For example, an impact that could affect public health and safety or could result in significant environmental impacts is obviously of greater concern than a purely aesthetic issue associated with an advisory design guideline. It is important in comparing alternatives to focus on the key siting advantages and the potential adverse environmental effects of a particular site. Comparing each of the environmental disciplines and giving each discipline equal weight would provide a misleading analysis because effects in one area are not necessarily equivalent in importance to effects in another area.

For example, though the sites may differ in terms of available local road and street capacities and the current levels of traffic congestion, the number of workers during the operational phase of the project is low and would be unlikely to have a significant effect on local traffic. The sites may differ widely in the amount of traffic congestion they would cause during construction, but this is a temporary impact and should not be a strong consideration in site selection, as long as measures to mitigate this impact are feasible. The sites would not differ significantly in terms of geological hazards, though close proximity to

a major fault would call for more rigorous and expensive seismic engineering. Hazardous materials handling and worker health and safety issues would be the same or nearly the same for most sites. Though the risk of a release of hazardous materials during transport might be seen as more or less likely depending on location (roadway hazards, in particular), the record of safe transport and handling of such materials is clear. Further, the sites considered here are all in or near urban areas that are served by good transportation networks and are close to the sources of supply.

Similarly, project effects on paleontological and cultural resources are not often consequential in comparing alternatives. Even after an initial screening for effects on highly significant sites is completed, the probabilities of encountering hidden paleontological or cultural resources during construction are difficult to calculate or compare.

9.4.1 Project Development Constraints

As indicated in the introductory descriptions of each of the alternative sites, the basic needs of power plant siting for land, access to electrical transmission, gas supply, and cooling water, are met at each of the alternative sites. In addition, none of the sites would require construction of particularly long linear appurtenances. The San Jacinto and Dawson sites are somewhat more constrained in terms of transmission options than the SVEP site, because the available transmission right-of-way north of McLaughlin Road is taken up by the existing SCE 500-kV and 115-kV lines. The IEEC, in addition, plans to construct a second 500-kV line along McLaughlin Road and to reroute and bury the existing 115-kV line that is currently located there in a new location between McLaughlin Road and the existing 500-kV line. This means that transmission for either of these two sites would either have to run south of McLaughlin Road or north of the existing 500-kV line. If the latter alternative were chosen, much less land would be available for project development.

9.4.2 Air Quality

The quantity of emissions from project operation would be the same at any of the sites. Each of the sites has similar contributions to airsheds and would, therefore, be subject to similar review, emission reduction crediting, and permitting requirements. Each site is located in relatively flat terrain that will help to promote dispersion of emissions. Small differences between the sites in distance from the nearest residences should not make a significant difference in air quality impacts at these residences. Mitigation would bring any potential impacts to a level below significance for any of the alternatives.

9.4.3 Biological Resources

None of the three sites provides good habitat for fish, wildlife, or sensitive plant species. All three are in or have recently been in agricultural use. A drainage feature that is tributary to or part of Ethanac Wash runs along the southern boundary of the Dawson and San Jacinto sites. The jurisdictional status of this feature has not been formally determined and it will, at some point, be replaced by a box culvert. In the meantime, seasonal ponds along or near this drainage feature on the San Jacinto property are potential habitat for the federally threatened vernal pool fairy shrimp (*Branchinecta lynchii*). Development on this site would therefore require a Clean Water Act Section 404 permit to fill wetlands and also consultation with the United States Fish and Wildlife Service (USFWS) regarding endangered species. Each of the sites is located within the Stephens' kangaroo rat fee area.

9.4.4 Cultural Resources

There would be few significant differences in cultural resources among the three sites, based on current information. Known archaeological sites would not be directly affected (buried sites are possible in any location).

9.4.5 Geological Resources and Hazards

There would be no significant differences between the sites in terms of geological resources and hazards. There are no geological resources located at or near any of the sites.

9.4.6 Hazardous Materials Handling

There would be no significant difference between the site locations in terms of hazardous materials handling. The uses of hazardous materials would be the same for any of the sites. Though there might be differences in the distances that trucks carrying hazardous materials would travel to deliver the materials, these differences would be minor and would not necessarily be consequential, given the effective mitigation measures available and the excellent safety record for transport of these materials.

9.4.7 Land Use

Each of the threes sites is currently zoned for industrial use. The SVEP site is zoned manufacturing/service commercial. The San Jacinto and Dawson sites are zoned for heavy industry within the Menifee North Specific Plan. Each of these is an appropriate zoning for a peaking power plant. Residential uses of relatively high density are immediately adjacent to and north of the Dawson Road site, though a power plant could be sited on a subset of this area to be further from these uses. The zoning on the southern parcels in this area, however, is residential, which limits the potential design flexibility. Dense and existing residential uses are located about 1,000 feet from the San Jacinto Road site, along State Route 74. The nearest dense residential development to the SVEP site is approximately 3,000 feet to the south. The Menifee Valley Ranch development, however, is under construction and will include residential and commercial uses approximately 1,000 feet east of from the SVEP project site boundary.

9.4.8 Noise

The SVEP and San Jacinto sites have sufficient distance from residential receptor that they would be able to meet the County noise standards with the application of standard controls. The Dawson Road site would have difficulty doing so, because of the residences at the northern boundary and residential zoning in the southern portion of the site. There could be cumulative impact noise issues with the San Jacinto and Dawson sites because of their proximity to the IEEC, which is under construction.

9.4.9 Paleontology

There would be no significant differences between the project sites in terms of potential effects on paleontological resources. None of the sites is located at a known paleontological find location, although significant Pleistocene fossils have been found nearby in similar alluvial deposits. The probability of encountering significant fossils is approximately the same at all sites.

9.4.10 Public Health

The project would not be likely to cause significant adverse long-term health impacts (either cancer or non-cancer) from exposure to toxic emissions, regardless of the site chosen.

9.4.11 Socioeconomics

All three sites are located in Riverside County. The number of workers, construction costs, payroll, and property tax revenues would be nearly the same for the project at each of the sites. The majority of the workers would come from the Inland Empire (Perris-Moreno Valley-Riverside) depending on the site. Most workers would commute daily or weekly to the plant site. Some may move temporarily to the local area during construction, causing site-specific impacts to schools, utilities, and emergency services. These impacts would be temporary. Disproportionate impacts to minority and low income populations would be unlikely since minority populations are not concentrated in an area or areas that are also high potential impact areas. The project is not likely to cause significant adverse public health impacts to areas that are disproportionately minority or low income.

9.4.12 Soils and Agriculture

There would not be significant differences between the alternative sites in terms of their potential effects on soils and agriculture. None of the sites would result in the loss of prime or unique farmlands or farmlands of statewide importance. All are currently or were recently agricultural land.

9.4.13 Traffic and Transportation

The number of employees working at a given time during project operation (approximately 3) will not significantly impact local traffic conditions at any of the sites. The peak number of employees during construction (228) will have much more impact, but the impact will be temporary, and can be mitigated by transportation management planning The effect on construction-phase traffic, therefore, should not figure as a major consideration in evaluating or comparing the sites.

9.4.14 Visual Resources

None of the sites is located in an area with protected viewshed or in a designated viewshed corridor. The visual effects are roughly the same. The SVEP site will be visible from the nearby residential area of Menifee Valley Ranch when it is constructed. This view will eventually be substantially blocked, however, by industrial development between Menifee Road and the project site. In addition, homes in Menifee Valley Ranch nearest to the project site, those along Menifee Road, will not have front driveways on Menifee Road, but will instead have back yard walls to Menifee Road. The project will thus not be particularly visible from within the residential development.

9.4.15 Water Resources

Each of the sites would be able to use tertiary treated recycled water for power plant cooling. This is consistent with the State Water Resources Control Board's Policy 75-58 indicating that water for power plant cooling should avoid using fresh inland waters if other waters (such as treated wastewater) are available.

9.4.16 Waste Management

The management of wastes would not differ significantly between the project site and the alternatives. All three sites are currently vacant and no demolition would be necessary with the associated waste generation. The San Jacinto site currently contains large piles of asphalt and other construction materials, and the Dawson Road is used for equipment storage, but it is assumed that these materials would be removed before VSE would assume site control.

9.4.17 Summary and Comparison

Returning to the original site selection criteria as described in Section 9.3, it is clear that power plant siting is feasible at most of these alternative sites. A summary of environmental and project development constraints is presented in Table 9-2. Following is a summary of site feasibility factors:

- **Location more than 1,000 feet from the nearest residential area—**Each of the sites meets this standard, depending on configuration. The facilities at the Dawson site, however, would have to be sited near the southern end of the site area to meet this standard. They would then be located adjacent to the residential zoning at the southern end of the site.
- **Location near the centers of electrical demand—**All of the sites are in the rapidly growing Inland Empire area, which has residential and industrial demand for power.
- **Land zoned for industrial use—**All of the sites are zoned industrial or manufacturing.
- **Location near a sufficient source of cooling water, preferably treated wastewater—**Reclaimed water is available at each of the sites.
- **Location near electrical transmission facilities—**Each of the sites is near the Valley Substation, although routing a transmission line for the Dawson and San Jacinto sites would be more difficult than for the SVEP site.
- **Location near ample natural gas supply—**All three of the sites are relatively near the Southern California Gas Company (SoCalGas) distribution pipelines in Menifee Road. SVEP is the nearest, requiring a 750-foot pipeline. The Dawson site would require a pipeline of a mile or more.
- **Parcel or adjoining parcels of sufficient size for a power plant—**There is sufficient land available at each parcel to develop a power plant.
- **Site control feasible—**VSE has an option agreement to purchase the SVEP site. The others are privately owned and have multiple owners, and site control may or may not be difficult to obtain.
- **Mitigation of potential impacts feasible—**Mitigation of potentially significant environmental impacts appears feasible at each of the sites. Mitigation for noise impacts could be prohibitively expensive, however, at the Dawson site, depending on configuration, because of proximity to residential areas and the IEEC.

In conclusion, the SVEP site offers some environmental siting advantage over the other two sites. Each of the sites would meet the project objectives. The San Jacinto site raises environmental impact issues having to do with its location in the 100-year floodplain, and the seasonal pond feature that may provide habitat for the federally threatened vernal pool

fairy shrimp. The Dawson site would require greater capital costs for more lengthy linears, interconnection in particular, and could have difficulty meeting County noise standards because it is located very near residential receptors. For these reasons, the SVEP site was chosen as the project site.

9.5 Alternative Project Design Features

The following section addresses alternatives to some of the SVEP design features, such as the locations of the natural gas supply pipeline, electrical transmission line, and water supply pipeline, and the radio broadcast tower relocation.

9.5.1 Alternative Natural Gas Supply Pipeline Routes

Because a short (750-foot-long), direct route to the high-pressure pipelines in Menifee Road is available and is located entirely on project property, no other alternatives are deemed feasible for consideration.

9.5.2 Electrical Transmission System Alternatives

The preferred transmission alternative is to connect with the SCE Valley Substation through a 600-foot-long, double-circuit, 115-kV transmission line that will run north from the SVEP to the southern portion of the Valley Substation, using a single monopole tower. The alternative is a 2,000-foot-long line that would extend northward along an existing transmission corridor and connect with the northern end of the Valley Substation. The choice of alternatives will be considered during SCE's final design stage. SCE has indicated that the preferred alternative, connection at the southern end of the Valley Substation, is feasible.

9.5.3 Water Supply Alternatives

The EMWD will supply reclaimed water for the proposed project as described in Section 7.0 through a pipeline that runs immediately adjacent to the SVEP site. Other sources of water might include potable water from the County system. Well water would be another possible source of cooling water. Reclaimed water is clearly the better alternative, however, because it provides a beneficial use for treated wastewater which might otherwise be wasted. Using potable water from either the County's system or onsite wells would involve consuming large quantities of scarce fresh water for power plant cooling that could be more beneficially used for other purposes.

9.6 Technology Alternatives

The configuration of the SVEP was selected from a wide array of technology alternatives. These include generation technology alternatives, fuel technology alternatives, combustion turbine alternatives, nitrogen oxide (NO_x) control alternatives, inlet air cooling alternatives, and heat rejection alternatives.

9.6.1 Generation Technology Alternatives

Selection of the power generation technology focused on those technologies that can utilize the natural gas readily available from the existing transmission system. Following are discussions of the suitability of such technologies for application to the SVEP.

9.6.1.1 Conventional Boiler and Steam Turbine

This technology burns fuel in the furnace of a conventional boiler to create steam. The steam is used to drive a steam turbine-generator, and the steam is then condensed and returned to the boiler. This is an outdated technology that is able to achieve thermal efficiencies up to approximately 36 percent when utilizing natural gas, although efficiencies are somewhat higher when utilizing oil or coal. Because of this low efficiency and large space requirement, the conventional boiler and steam turbine technology was eliminated from consideration.

9.6.1.2 Conventional Simple-Cycle Combustion Turbine

Conventional aeroderivative turbine-generator units are able to achieve thermal efficiencies up to approximately 38 percent. In comparison, the LMS100 turbine-generator can achieve efficiencies of up to 44 percent. The LMS100 also has a quick startup capability and lower capital cost than that of a combined-cycle, and is very appropriate for peaking applications. Because of its relatively low efficiency, conventional simple-cycle technology tends to emit more air pollutants per kilowatt-hour generated than the LMS100 will. Because of this relatively low efficiency, the conventional simple-cycle combustion turbine technology was eliminated from consideration.

9.6.1.3 Conventional Combined-Cycle

This technology integrates combustion turbines and steam turbines to achieve higher efficiencies. The combustion turbine's hot exhaust is passed through a heat recovery system generator (HRSG) to create steam used to drive a steam turbine-generator. This technology is able to achieve high thermal efficiencies. The combined-cycle alternative, however, requires very large capital cost more appropriate for a baseload facility, a large site, and very large quantities of water for cooling. In addition, conventional combined-cycle technology cannot match the GE Energy LMS100 technology for rapid startup, sustained hot-day power, efficient cycling, and high part-power efficiency and load following capability. These are essential characteristics for a peaking facility.

9.6.1.4 Kalina Combined-Cycle

This technology is similar to the conventional combined-cycle, except a mixture of ammonia and water is used in place of pure water in the steam cycle. The Kalina cycle could potentially increase combined cycle thermal efficiencies by several percentage points. However, because this technology is still in the development phase and has not been commercially demonstrated, it was eliminated from consideration.

9.6.1.5 Advanced Combustion Turbine Engines

There are a number of efforts to enhance the thermal efficiency of combustion turbines by injecting steam or staged firing. These include the steam-injected gas turbine (STIG), the intercooled steam-recuperated gas turbine (ISRGT), the chemically recuperated gas turbine (CRGT), and the humid air turbine (HAT) cycle. The STIG is less efficient than other

technologies, uses large amounts of de-ionized water and is only able to achieve thermal efficiencies up to approximately 40 percent. None of the remaining technologies, ISRGT, CRGT, or HAT, is commercially available. Consequently, all of these technologies were eliminated from consideration.

9.6.2 Fuel Technology Alternatives

Technologies based on fuels other than natural gas were eliminated from consideration because they do not meet the project objective of utilizing natural gas available from the existing transmission system. Additional factors rendering alternative fuel technologies unsuitable for the proposed project are as follows:

- No geothermal or hydroelectric resources exist in Riverside County.
- Biomass fuels such as wood waste are not locally available in sufficient quantities to make them a practical alternative fuel and SVEP site space is limited.
- Solar and wind technologies are generally not dispatchable and are therefore not capable of producing ancillary services other than reactive power, and SVEP site space is limited.
- Coal and oil technologies emit more air pollutants than technologies utilizing natural gas.
- The availability of the natural gas resource provided by SoCalGas, as well as the environmental and operational advantages of natural gas technologies, make natural gas the logical choice for the proposed project.

9.6.3 NO_x Control Alternatives

To minimize NO_x emissions from the SVEP, the combustion turbine generators (CTGs) will be equipped with water injection combustors and the HRSGs will be equipped with post-combustion selective catalytic reduction (SCR) using aqueous ammonia as the reducing agent. The following combustion turbine NO_x control alternatives were considered:

- Steam injection (capable of 25 to 42 parts per million [ppm] NO_x)
- Water injection (capable of 25 to 42 ppm NO_x)
- Dry low-NO_x combustors (capable of 15 to 25 ppm NO_x)

Water injection was selected because it allows for lower acceptable NO_x emissions while being able to achieve an output turndown rate of 30 percent. This turndown is necessary to meet variable load demand.

Two post-combustion NO_x control alternatives were considered:

- SCR
- SCONO$_x$™

SCR is a proven technology and is used frequently in combined cycle applications. Ammonia is injected into the exhaust gas upstream of a catalyst. The ammonia reacts with NO_x in the presence of the catalyst to form nitrogen and water.

SCONO$_x$™ is a new technology and there has been only implementation: a 25-megawatt (MW) combined-cycle plant. SCONO$_x$™ consists of an oxidation catalyst, which oxidizes

carbon monoxide (CO) to carbon dioxide (CO_2) and nitric oxide (NO) to nitrogen dioxide (NO_2). The NO_2 is adsorbed onto the catalyst, and the catalyst is periodically regenerated. Although a potentially promising technology, SCONO$_x$™ has not been commercially demonstrated on a large power plant. There are several technological and commercial issues remaining to be resolved prior to application of this new technology to the class of combustion turbines selected for the proposed project.

The following reducing agent alternatives were considered for use with the SCR system:

- Anhydrous ammonia
- Aqueous ammonia
- Urea

Anhydrous ammonia is used in many combined cycle facilities for NO_x control, but is more hazardous than diluted forms of ammonia. Aqueous ammonia (19-percent ammonia, 81-percent water solution) is proposed for the SVEP because of its safety characteristics. Urea has not been commercially demonstrated for long-term use with SCR and was therefore eliminated from consideration.

9.6.4 Heat Rejection Alternatives

The SVEP will employ a surface condenser cooled by circulating water, with heat rejection provided by a mechanical draft, wet cooling tower. An air-cooled condenser was considered as an alternative. The wet cooling tower was found to be the most cost-effective heat rejection system and produces the highest plant efficiency.

The advantages of an air-cooled condenser include reductions in makeup water requirements, water vapor plumes, and cooling tower drift. Among the disadvantages of the air-cooled condenser are the land area requirements and high cost. Condenser performance is inversely related to the temperature of the cooling medium. The local climate in the project area is characterized by high dry-bulb temperatures and low wet-bulb temperatures (i.e., low relative humidity). Consequently, the performance of an air-cooled condenser (which is inversely related to dry-bulb temperature) is poor compared to the performance of a surface condenser cooled by circulating water (which is inversely related to wet-bulb temperature). The air-cooled condenser's relatively poor performance results in relatively high steam turbine backpressure, which negatively impacts steam turbine output and efficiency. This negative impact causes a decrease in overall plant output and efficiency. The air-cooled condenser also uses more auxiliary power because of the greater number and horsepower of its fans as compared to the wet cooling tower. As a result, net plant output and efficiency are further reduced. In addition, the capital cost and land requirements of an air-cooled condenser greatly exceed the cost of a surface condenser, circulating water system, and wet cooling towers.

The air-cooled heat exchanger's disadvantages of reduced plant output, reduced plant efficiency, and higher capital costs were found to outweigh the advantage of reduced water consumption.